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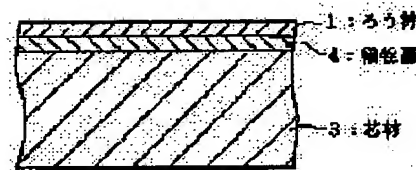
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## (54) BRAZING SHEET MADE OF ALUMINUM ALLOY

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To suppress the reduction of Zn in a brazing filler metal in the case of brazing and heating, to secure excellent corrosion resistance by sacrificial anode effect, to improve the strength of a core material and to thin the product in a brazing sheet made of an aluminum alloy using as Al-Si series brazing filler metal added with Zn for showing sacrificial anode effect by the brazing filler metal.

**SOLUTION:** At least one side of a core material 3 essentially of Al-Mg-Si series is clad with a sacrificial layer 4 contg. 1.0 to 4.0wt.% Zn, and the balance Al with inevitable impurities, furthermore, the surface of the sacrificial layer is clad with an Al alloy brazing filler metal 1 contg. 6.0 to 13.0wt.% Si and 1.5 to 4.0% Zn, and moreover, the difference between the Zn content in the brazing filler metal (AZn) and the Zn content in the sacrificial layer (BZn), i.e., [(AZn)-(BZn)] is regulated to the range of 0 to +1.0wt.%.



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**CLAIMS**


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**[Claim(s)]**

[Claim 1] The clad of the sacrifice layer to which Zn1.0 – 4.0wt% is contained at least on one side of the core material which consists of an aluminum–Mg–Si system alloy, and the remainder becomes it from aluminum and an unescapable impurity is carried out. The clad of the wax material to which Si6.0 – 13.0wt% and Zn1.5 – 4.0wt% is contained, and the remainder furthermore consists of aluminum and an unescapable impurity on the sacrifice layer is carried out. And the brazing sheet made from an aluminium alloy excellent in the corrosion resistance characterized by setting the difference [(AZn)–(BZn)] of the amount (AZn) of Zn of said wax material, and the amount (BZn) of Zn of a sacrifice layer to 0 – 1.0wt% of within the limits.

[Claim 2] Zn1.0 – 4.0wt% is contained at least on one side of the core material which consists of an aluminum–Mg–Si system alloy. And Mn0.1 – 1.5wt%, Cu0.06 – 0.3wt%, Ti0.06 – 0.3wt%, Mg0.06 – 0.5wt%, Si0.4 – 1.0wt%, Cr0.06 – 0.3wt%, The clad of the sacrifice layer which 1 of Zr0.06 – 0.3wt% of sorts and two sorts or more are contained, and the remainder becomes from aluminum and an unescapable impurity is carried out. The clad of the wax material to which Si6.0 – 13.0wt% and Zn1.5 – 4.0wt% is contained, and the remainder furthermore consists of aluminum and an unescapable impurity on the sacrifice layer is carried out. And the brazing sheet made from an aluminium alloy excellent in corrosion resistance characterized by setting the difference [(AZn)–(BZn)] of the amount (AZn) of Zn of said wax material, and the amount (BZn) of Zn of a sacrifice layer to 0 – 1.0wt% of within the limits.

[Claim 3] The clad of the sacrifice layer to which Zn1.0 – 4.0wt% is contained at least on one side of the core material which consists of an aluminum–Mg–Si system alloy, and the remainder becomes it from aluminum and an unescapable impurity is carried out. Furthermore on the sacrifice layer, Si6.0 – 13.0wt% and Zn1.5 – 4.0wt% is contained. And Bi0.01 – 0.3wt%, Be0.0001 – 0.002wt%, In0.01 – 0.10wt%, The clad of the wax material which 1 of Ga0.01 – 0.10wt% of sorts and two sorts or more are contained, and the remainder becomes from aluminum and an unescapable impurity is carried out Sn0.01 – 0.10wt%. And the brazing sheet made from an aluminium alloy excellent in the corrosion resistance characterized by setting the difference [(AZn)–(BZn)] of the amount (AZn) of Zn of said wax material, and the amount (BZn) of Zn of a sacrifice layer to 0 – 1.0wt% of within the limits.

[Claim 4] Zn1.0 – 4.0wt% is contained at least on one side of the core material which consists of an aluminum–Mg–Si system alloy. And Mn0.1 – 1.5wt%, Cu0.06 – 0.3wt%, Ti0.06 – 0.3wt%, Mg0.06 – 0.5wt%, 0.4 – 1.0% of Si, Cr0.06 – 0.3wt%, The clad of the sacrifice layer which 1 of Zr0.06 – 0.3wt% of sorts and two sorts or more are contained, and the remainder becomes from aluminum and an unescapable impurity is carried out. Furthermore, Si6.0 – 13.0wt% and Zn1.5 – 4.0wt% is contained on the sacrifice layer. And Bi0.01 – 0.3wt%, Be0.0001 – 0.002wt%, The clad of the wax material which 1 of Ga0.01 – 0.10wt% of sorts and two sorts or more are contained, and the remainder becomes from aluminum and an unescapable impurity is carried out Sn0.01 – 0.10wt% In0.01 – 0.10wt%. And the brazing sheet made from an aluminium alloy excellent in corrosion resistance characterized by setting the difference [(AZn)–(BZn)] of the amount (AZn) of Zn of said wax material, and the amount (BZn) of Zn of a sacrifice layer to 0 – 1.0wt% of within the limits.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Field of the Invention] This invention relates to the brazing sheet made from an aluminium alloy which can demonstrate the corrosion resistance which was excellent when a heat exchanger etc. was cured with the application of inert gas soldering, for example, saw lock soldering, and the structure was especially assembled about the brazing sheet made from an aluminium alloy which cures various heat exchangers etc. and is used for the structure.

#### [0002]

[Description of the Prior Art] As a heat exchanger, for example, the radiator, an oil cooler, etc. for automobiles, they are copper and stainless steel conventionally. — Although the copper thing was common In order that these may use the wax material containing lead, the brazing sheet made from an aluminium alloy which carried out the clad of the aluminium alloy wax material which avoids this from the point of an environmental problem recently, and consists of an aluminum-Si system alloy comes to be used abundantly. Moreover, a heat exchanger etc. is cured and the brazing sheet made from an aluminium alloy is liked also from points, such as lightweight-izing of the structure.

[0003] By the way, when assembling a radiator and an oil cooler using the brazing sheet made from an aluminium alloy, the corrosion resistance (generally called internal corrosive) over the corrosion from the side in contact with water becomes important. Then, in order to raise internal corrosion resistance, preparing a sacrifice corrosion layer in the field of the side in contact with water is performed from the former. The component presentation of an alloy is adjusted so that this sacrifice corrosion layer may serve as \*\*\*\* potential from the potential of a core material. Since it is also rare to worsen the property of others [ addition / of Zn ] that it is effective in order that the sacrificial anode effectiveness over the aluminium alloy of a core material may be given and addition of Zn may make potential \*\* in the case of an aluminium alloy and, The aluminium alloy which made potential \*\* is used as a sacrifice corrosion layer by generally adding Zn in many cases.

[0004] Here, when there is no need of soldering to the side in contact with water, in the inside side of tube material, the brazing sheet which prepared the sacrifice corrosion layer containing Zn, such as an aluminum-Zn system alloy or an aluminum-Mg-Zn system alloy, in the water contact side is used. When it is necessary to solder to the side which contacts water like an oil cooler on the other hand, giving the sacrificial anode effectiveness to the usual aluminium alloy wax material (an aluminum-Si system alloy, aluminum-Si-Bi system alloy, etc.) as wax material by the side of water contact at wax material using the alloy which added Zn, i.e., making it serve both as a wax material layer with a sacrifice corrosion layer, is performed. in addition, 3003 of a common aluminum-Mn system alloy alloys use it for a core — having — the reinforcement after soldering heating — about 120 — N/mm<sup>2</sup> it is .

#### [0005]

[Problem(s) to be Solved by the Invention] When Zn is added to wax material as mentioned above and the sacrificial anode effectiveness is given to the wax material layer itself, the corrosion resistance by the sacrificial anode effectiveness expected depending on soldering

conditions may not be acquired. Furthermore, thinning is required for lightweight-izing and the improvement in on the strength after soldering heating is demanded in connection with it.

[0006] Here, when corrosion resistance is described, the wax material containing Zn will fuse at the time of soldering heating, but since the maximum vapor tension in an elevated temperature is high, evaporation of Zn from the fused wax material front face tends to produce Zn. That is, since the fused wax material is the liquid phase, the diffusion rate of Zn inside wax material is also high, therefore if Zn evaporates from a melting wax material front face and the amount of Zn of a wax material surface layer decreases, Zn will carry out spreading diffusion from the interior of melting wax material easily to a surface layer, it will evaporate from a front face, and, as a result, the amount of Zn of the whole wax material will decrease and go. And in the case of the usual core material in which the core material of the wax material bottom does not contain Zn, diffusion of Zn to the direction of a core material is also produced in melting wax material, and a result which this also makes accelerate reduction of the amount of Zn in wax material is brought again. In the case of the vacuum soldering method widely used especially for soldering of an aluminium alloy Since a melting wax material front face is always decompressed at the time of soldering heating, evaporation of Zn from a melting wax material front face advances quickly. The amount of Zn in wax material decreases quickly, therefore the amount of Zn in the wax material after soldering heating decreases, and the effectiveness of making potential of wax material into \*\* by Zn is not fully acquired. As a result, a wax material layer will not fully be able to demonstrate the sacrificial anode effectiveness, but it will be difficult to acquire the expected corrosion resistance. Then, when Zn addition wax material which expected the sacrificial anode effectiveness is used, the vacuum soldering method is not applied, but usually soldering in an inert gas ambient atmosphere is applied. That is, it is because inert gas soldering is generally soldered in the inert gas ambient atmosphere of 1 atmospheric-pressure extent, so I will shine as compared with the case of vacuum soldering and it is thought that there is little evaporation of Zn at the time of heating.

[0007] However, even when soldering in an inert gas ambient atmosphere, under the latest operating condition, the actual condition was that evaporation of most quantity of Zn arises in fact, and sufficient corrosion resistance is not necessarily acquired for the reason. Namely, in order to curse in an inert gas ambient atmosphere, to raise the programming rate of an ingredient recently at the time of heating and to raise productivity Although rotate a fan all over a soldering furnace, a hot controlled atmosphere is made to produce the convection current and it operates more often by making it tell heat from an ambient atmosphere quickly to an ingredient Since in the case of such an operating method a controlled atmosphere \*\*\*\* continuously on a melting wax material front face and flows on it at the time of soldering heating, in order to maintain the balanced partial pressure of Zn in the interface of a melting wax material front face, Zn always continues evaporating from a melting wax material front face, and diffusion of Zn by the side of [ out of melting wax material ] a core material arises in coincidence, consequently even if it is not comparable to the case where it is the vacuum soldering method Corrosion resistance to the extent that the amount of Zn in the wax material after soldering heating decreased, it becomes impossible for wax material to have demonstrated sufficient sacrificial anode effectiveness to the core material and it expected by reduction of the amount of Zn in wax material may not no longer be acquired.

[0008] As one policy for solving an above-mentioned problem, although it is possible to set the amount of Zn beforehand added to wax material as many eyes, here If there are too many amounts of Zn, since the new problem that the saw lock flux and Zn which are used by inert gas soldering in many cases will react and shine, and a sex will fall will arise, such a policy is also inapplicable in fact.

[0009] Moreover, the thinning of a material is required for lightweight-izing of a heat exchanger, and the improvement in on the strength after soldering heating of a brazing sheet is demanded in connection with it. however — 3003 of the aluminum-Mn system alloy generally conventionally used as a core alloys — the reinforcement after soldering heating — about 120 — N/mm<sup>2</sup> it is — it cannot be said to be sufficient reinforcement.

[0010] This invention was made against the background of the above situation, and using an

aluminum-Mg-Si system alloy as a brazing sheet made from an aluminium alloy using the wax material which aimed at the sacrificial anode effectiveness by addition of Zn to a core material. Reduction of the amount of Zn in the wax material at the time of soldering heating is controlled as much as possible, without making the quantity of the amount of Zn of wax material increase superfluously. Sufficient corrosion resistance can be demonstrated after soldering heating by this, and moreover, the reinforcement after soldering heating is also high and it aims at soldering nature offering a good brazing sheet.

[0011]

[Means for Solving the Problem] In order to solve the above technical problems, in the brazing sheet made from an aluminium alloy of this invention, the interlayer (sacrifice layer) containing a suitable quantity of Zn is prepared between the wax material and core materials which added Zn fundamentally, and Zn of a considerable amount was secured into surface wax material also in the condition after soldering heating.

[0012] Specifically the brazing sheet made from an aluminium alloy of invention of claim 1 The clad of the sacrifice layer to which Zn1.0 – 4.0wt% is contained at least on one side of the core material which consists of an aluminum-Mg-Si system alloy, and the remainder becomes it from aluminum and an unescapable impurity is carried out. The clad of the wax material to which Si6.0 – 13.0wt% and Zn1.5 – 4.0wt% is contained, and the remainder furthermore consists of aluminum and an unescapable impurity on the sacrifice layer is carried out. And it is characterized by setting the difference [(AZn)-(BZn)] of the amount (AZn) of Zn of said wax material, and the amount (BZn) of Zn of a sacrifice layer to 0 – 1.0wt% of within the limits.

[0013] Moreover, the brazing sheet made from an aluminium alloy of invention of claim 2 Zn1.0 – 4.0wt% is contained at least on one side of the core material which consists of an aluminum-Mg-Si system alloy. And Mn0.1 – 1.5wt%, Cu0.06 – 0.3wt%, Ti0.06 – 0.3wt%, Mg0.06 – 0.5wt%, Si0.4 – 1.0wt%, Cr0.06 – 0.3wt%, 1 of Zr0.06 – 0.3wt% of sorts and two sorts or more are contained. The clad of the sacrifice layer which the remainder becomes from aluminum and an unescapable impurity is carried out, and it contains Si6.0 – 13.0wt% and Zn1.5 – 4.0wt% on the sacrifice layer further. It is characterized by carrying out the clad of the wax material which the remainder becomes from aluminum and an unescapable impurity, and setting the difference [(AZn)-(BZn)] of the amount (AZn) of Zn of said wax material, and the amount (BZn) of Zn of a sacrifice layer to 0 – 1.0wt% of within the limits.

[0014] Furthermore, the brazing sheet made from an aluminium alloy of invention of claim 3 Zn1.0 – 4.0wt% is contained at least on one side of the core material which consists of an aluminum-Mg-Si system alloy. The clad of the sacrifice layer which the remainder becomes from aluminum and an unescapable impurity is carried out. Further on the sacrifice layer Si6.0 – 13.0wt% and Zn1.5 – 4.0wt% is contained. And Bi0.01 – 0.3wt%, Be0.0001 – 0.002wt%, 1 of Ga0.01 – 0.10wt% of sorts and two sorts or more are contained Sn0.01 – 0.10wt% In0.01 – 0.10wt%. It is characterized by carrying out the clad of the wax material which the remainder becomes from aluminum and an unescapable impurity, and setting the difference [(AZn)-(BZn)] of the amount (AZn) of Zn of said wax material, and the amount (BZn) of Zn of a sacrifice layer to 0 – 1.0wt% of within the limits.

[0015] Again and the brazing sheet made from an aluminium alloy of invention of claim 4 Zn1.0 – 4.0wt% is contained at least on one side of the core material which consists of an aluminum-Mg-Si system alloy. And Mn0.1 – 1.5wt%, Cu0.06 – 0.3wt%, Ti0.06 – 0.3wt%, Mg0.06 – 0.5wt%, Si0.4 – 1.0wt%, Cr0.06 – 0.3wt%, 1 of Zr0.06 – 0.3wt% of sorts and two sorts or more are contained. The clad of the sacrifice layer which the remainder becomes from aluminum and an unescapable impurity is carried out. Further on the sacrifice layer Si6.0 – 13.0wt% and Zn1.5 – 4.0wt% is contained. And Bi0.01 – 0.3wt%, Be0.0001 – 0.002wt%, 1 of Ga0.01 – 0.10wt% of sorts and two sorts or more are contained Sn0.01 – 0.10wt% In0.01 – 0.10wt%. It is characterized by carrying out the clad of the wax material which the remainder becomes from aluminum and an unescapable impurity, and setting the difference [(AZn)-(BZn)] of the amount (AZn) of Zn of said wax material, and the amount (BZn) of Zn of a sacrifice layer to 0 – 1.0wt% of within the limits.

[0016] In the brazing sheet made from an aluminium alloy of this invention, the sacrifice layer which consists of an aluminium alloy containing Zn1.0 – 4.0wt% intervenes between the wax

material containing Zn [ which is the maximum surface layer ]1.5 – 4.0wt%, and the core material which does not contain Zn substantially, and it is determined that the amount of Zn of the sacrifice layer of a parenthesis and the amount of Zn of wax material serve as specific relation as shown by said formula. This formula has more amounts of Zn of wax material than the amount of Zn of a sacrifice layer, and shows that both difference is less than [ 1.0wt% ].

[0017] By making the sacrifice layer containing Zn of such a specific amount intervene between wax material and a core material Diffusion of Zn to the direction out of the melting wax material at the time of soldering heating of a core material decreases. Reduction of the amount of Zn in the wax material under soldering heating is controlled, it can become possible to, fully secure the amount of Zn in the wax material after soldering heating as a result, the sacrificial anode effectiveness by wax material can fully be demonstrated, and the outstanding corrosion resistance can be secured. namely, when the sacrifice layer containing such Zn does not intervene between wax material and a core material and a core material does not contain Zn substantially Although the amount of Zn in wax material will decrease quickly when Zn in melting wax material is spread in the direction of a core material while Zn evaporates from the already described wax material front face which was fused like at the time of soldering heating In the case of this invention, at least, since diffusion of Zn to the direction of a core material is controlled, advance of reduction of Zn in wax material can become slow, and most quantity of Zn can be secured into wax material also after soldering heating.

[0018] Here, the relation by said formula of the amount of Zn in wax material and the amount of Zn in a sacrifice layer is explained. First, it is required for there to be more amounts of Zn in wax material than the amount of Zn in a sacrifice layer. This is because the amount of Zn in the sacrifice layer after soldering heating will increase more than the amount of Zn in a wax material layer, and the potential of wax material will become \*\* from a sacrifice layer, therefore the sacrificial anode effectiveness by wax material will no longer be acquired and corrosion resistance will fall as a result, if there are more amounts of Zn in a sacrifice layer than the amount of Zn in wax material. Moreover, it is required for the difference of the amount of Zn in wax material and the amount of Zn in a sacrifice layer to be less than [ 1wt% ]. As for this, both difference exceeds 1wt%. In being large Become easy to diffuse Zn to a sacrifice layer side from a wax material side at the time of soldering heating. Therefore, it is because the effectiveness which controls reduction of the amount of Zn in the melting wax material at the time of soldering heating is not fully acquired, the amount of Zn in the wax material after soldering heating also decreases, and the sacrificial anode effectiveness by wax material is not fully acquired but sufficient corrosion resistance is no longer acquired. In addition, the value of the difference [(AZn)–(BZn)] of the amount (AZn) of Zn in wax material and the amount (BZn) of Zn in a sacrifice layer has +0.3 – +0.7wt% of especially desirable within the limits, although sufficient effectiveness will be acquired if it is 0 – +1.0wt% of within the limits.

[0019] Moreover, since the uniform layer of Zn distribution is formed by preparing the sacrifice layer containing Zn between wax material and a core material, corrosion resistance dependability increases compared with the case where this layer does not exist, and the effectiveness which controls generating of sudden pitting especially is also acquired.

[0020] Next, the component presentation of each configuration layer in the brazing sheet of this invention is explained to a detail.

[0021] Component presentation [ of <<core material >> ]

[0022] It is necessary to use a core material as an aluminum–Mg–Si system alloy first for the improvement in on the strength after soldering heating. It is appropriate to use the alloy with which Mg:0.1–0.5% and Si:0.4 – 1.0wt% are contained as a fundamental component, and the remainder consists of aluminum and an unescapable impurity as a core material. Moreover, it is still more appropriate with fundamental component Mg:0.1–0.5% and Si:0.4 – 1.0wt% to use the alloy with which 1 of Zr0.06 – 0.3wt% of sorts and two sorts or more are contained Cr0.06 – 0.3wt% Mn0.06 – 1.2wt%, and the remainder consists of aluminum and an unescapable impurity as a core material. With fundamental component Mg:0.1–0.5% and Si:0.4 – 1.0wt%, further Moreover, Cu0.06 – 0.3wt%, The alloy with which 1 of Ti0.06 – 0.3wt% of sorts and two sorts are contained, and the remainder consists of aluminum and an unescapable impurity, With fundamental



component Mg:0.1–0.5% and Si:0.4 – 1.0wt%, further Or Mn0.06 – 1.2wt%, 1 of Cr0.06 – 0.3wt%, Zr0.06 – 0.3wt% of sorts, two-sort or more, Cu0.06 – 0.3wt%, It is appropriate to use the alloy with which 1 of Ti0.06 – 0.3wt% of sorts and two sorts are contained, and the remainder consists of aluminum and an unescapable impurity as a core material.

[0023] The reason for limitation of a desirable component presentation of such a core material is explained.

[0024] Although Mg:Mg is an effective element in order to raise the reinforcement after soldering, the effectiveness has few amounts of Mg less than [ 0.10wt% ], and it reacts with the saw lock flux currently widely used by inert gas ambient atmosphere soldering if 0.5wt(s)% is exceeded on the other hand, will shine, and reduces a sex remarkably. Then, the amount of Mg is made into 0.10 – 0.5wt% of within the limits.

[0025] Si:Si is an effective element, in order to coexist with Mg, to shine and to raise next reinforcement. If the effectiveness has few amounts of Si less than [ 0.4wt% ] and 1.0wt(s)% is exceeded on the other hand, the melting point will fall and the erosion by the melting wax will become remarkably large. Then, the amount of Si is made into 0.4 – 1.0wt% of within the limits.

[0026] Mn, Cr, and Zr — the improvement in on the strength after soldering — effective — these elements — a kind — or two or more sorts add.

[0027] Mn:Mn raises pitting-proof nature while raising reinforcement, and it is an element effective in the improvement in resistance to the erosion by the melting wax. If such effectiveness is not fully acquired for the amount of Mn less than [ 0.06wt% ] but 1.2wt% is exceeded, while a huge intermetallic compound will be generated and spoiling rolling nature and a moldability, corrosion resistance will also fall, and intergranular corrosion susceptibility will increase. Then, as for the amount of Mn of a core material, it is desirable to consider as 0.06 – 1.2wt% of within the limits.

[0028] Cr, Zr:Cr, and Zr are effective elements in order that all may raise the reinforcement after soldering heating, but less than [ 0.06wt% ], a huge intermetallic compound will be generated and all will spoil fabrication nature, if the effectiveness is not fully acquired but exceeds 0.3wt(s)% on the other hand. Then, the amount of Cr(s) in the case of adding Cr and Zr and the amount of Zr have 0.06 – 0.3wt% of desirable within the limits respectively.

[0029] Cu and Ti — mainly — the corrosion-resistant improvement in a core material — effective — a kind — or two sorts add.

While Cu:Cu raises corrosion resistance by making potential of a core material into \*\*, in order to raise the reinforcement after soldering, it is an effective element, but such effectiveness has small Cu less than [ 0.06wt% ], if it adds exceeding 0.3wt(s)% on the other hand, it will become easy to generate pitting and corrosion resistance will fall. Therefore, the amount of Cu(s) in the case of adding Cu if needed has 0.06 – 0.3wt% of desirable within the limits.

[0030] In order that addition of Ti:Ti may make the maximum corrosion depth small and may raise corrosion resistance by this by changing pit-like forms of corrosion in the shape of a layer, it is effective while it makes potential of a core material \*\*. If such effectiveness is not fully demonstrated for the addition of Ti less than [ 0.06wt% ] but 0.3wt(s)% is exceeded on the other hand, such effectiveness will be saturated, and it is not only spoiling economical efficiency but aluminum<sub>3</sub>Ti. A huge intermetallic compound is generated and rolling nature and fabrication nature are spoiled. Therefore, the amount of Ti in the case of adding Ti if needed has 0.06 – 0.3wt% of desirable within the limits.

[0031] In addition, although Fe generally contains as an unescapable impurity in an aluminium alloy, since Fe reduces the corrosion resistance of a core material, few [ as much as possible ] things are desirable [ these ]. As for the amount of Fe(s), less than [ 0.7wt% ] is desirable, and, specifically, Fe may be less than [ 0.3wt% ] more preferably.

[0032] By using the core material of the above component presentations, it becomes possible to obtain the brazing sheet which has reinforcement even with after [ sufficient ] soldering heating, to be able to bear enough, even if it carries out the thinning of the board thickness from the conventional material, also in case a heat exchanger etc. is manufactured using this, therefore to fill a demand called lightweight-izing of components and equipment.

[0033] Component presentation [ of <<sacrifice layer >> ]

[0034] Next, a sacrifice layer is a layer required as already stated, in order that after soldering heating may maintain the amount of Zn of a wax material layer as much as possible, and after the corrosion of wax material advances at the time of the use as the soldering structure and the sacrificial anode effectiveness by wax material is no longer demonstrated, this sacrifice layer is useful for demonstrating the sacrificial anode effectiveness over a core material according to the potential difference with a core material, and maintaining corrosion resistance.

[0035] It contains the alloy-content elements with such a main sacrifice layer — Zn — it is — Zn1.0 – 4.0wt% — To alloy [ with which the remainder consists of aluminum and an unescapable impurity ] or Zn1.0 – 4.0wt% others Furthermore, Mn0.1 – 1.5wt%, Cu0.06 – 0.3wt%, Ti0.06 – 0.3wt%, Si0.4 – 1.0wt%, Cr0.06 – 0.3wt%, 1 of Zr0.06 – 0.3wt% of sorts and two sorts or more are contained, and the alloy with which the remainder consists of aluminum and an unescapable impurity can be used for a sacrifice layer Mg0.06 – 0.5wt%.

[0036] The reason for component limitation of such a sacrifice layer is explained below.

[0037] In order that it may be added by aluminum, and Zn:Zn may make the potential \*\* and may demonstrate the sacrificial anode effectiveness to a \*\*\*\* core material, it is an important element. Less than [ 1.0wt% ], the effectiveness was not acquired for the amount of Zn, and since a difference with the amount of Zn of wax material tended to have become more than 1.0wt% in less than 1.0 wts, the amount of Zn made 1.0wt(s)% the minimum of the amount of Zn of a sacrifice layer. Since self-corrosive action would become intense on the other hand if Zn is added exceeding 4.0wt(s)%, the upper limit of the amount of Zn of a sacrifice layer was made into 4.0wt(s)%. In addition, the amount of Zn of a sacrifice layer of it not only considering as 1.0 – 4.0wt% of within the limits, but being regulated from relation with the amount of Zn in wax material, as already stated is natural.

[0038] Mn:Mn is effective in the improvement in on the strength, and improvement in high temperature strength, and is an effective element also to the erosion by the melting wax. If such effectiveness is not acquired for the amount of Mn less than [ 0.1wt% ] but 1.5wt% is exceeded, such effectiveness is not only saturated, but a huge intermetallic compound will be generated and it will spoil rolling nature and a moldability. Then, the amount of Mn in the case of adding Mn was made into 0.1 – 1.5wt% of within the limits.

[0039] In order that Cu:Cu may raise the reinforcement after soldering, it is an effective element, but the effectiveness has small Cu less than [ 0.06wt% ], if it adds exceeding 0.3wt(s)% on the other hand, it will become easy to generate pitting and corrosion resistance will fall. Therefore, the amount of Cu(s) in the case of adding Cu was made into 0.06 – 0.3wt% of within the limits.

[0040] With the improvement in on the strength by dissolution, by changing pit-like forms of corrosion in the shape of a layer, addition of Ti:Ti makes the maximum corrosion depth small, and, thereby, contributes to corrosion-resistant improvement. If the effectiveness is not fully demonstrated for the addition of Ti less than [ 0.06wt% ] but 0.3wt(s)% is exceeded on the other hand, the effectiveness is saturated, and it not only spoils economical efficiency, but the huge intermetallic compound of aluminum<sub>3</sub> Ti will be generated and it will spoil rolling nature and fabrication nature. Therefore, the amount of Ti in the case of adding Ti was made into 0.06 – 0.3wt% of within the limits.

[0041] Mg:Mg is an effective element in order to raise the reinforcement after soldering, and when it coexists with Si, effectiveness is in the improvement in on the strength further. If the effectiveness has few amounts of Mg less than [ 0.06wt% ] and 0.5wt(s)% is exceeded on the other hand, by inert gas ambient atmosphere soldering, it will react with the saw lock flux currently used widely, I will shine, and a sex will be reduced remarkably. Then, the amount of Mg in the case of adding Mg was made into 0.06 – 0.5wt% of within the limits.

[0042] Si:Si is an effective element, in order to coexist with Mg, to shine and to raise next reinforcement. If the effectiveness has few amounts of Si less than [ 0.4wt% ] and 1.0wt(s)% is exceeded on the other hand, the melting point will fall and the erosion by the melting wax will become remarkably large. Then, the amount of Si in the case of adding Si was made into 0.4 – 1.0wt% of within the limits.

[0043] Cr, Zr:Cr, and Zr are effective elements in order that all may raise the reinforcement after soldering heating, but if the effectiveness is not fully acquired less than [ 0.06wt% ] but all

exceed 0.3wt(s)% on the other hand, a huge intermetallic compound will be generated and they will spoil fabrication nature. Then, the amount of Cr(s) in the case of adding either or the both sides of Cr and Zr and the amount of Zr were made into 0.06 – 0.3wt% of within the limits, respectively.

[0044] In addition, although Fe generally contains as an unescapable impurity in an aluminium alloy, since Fe reduces corrosion resistance, few [ as much as possible ] things are desirable [ these ]. As for the amount of Fe(s), less than [ 0.7wt% ] is desirable, and, specifically, Fe may be less than [ 0.3wt% ] more preferably.

[0045] Component presentation [ of <<wax material >> ]

[0046] Next, wax material receives the aluminum–Si system alloy currently generally used as aluminium alloy wax material. Add Zn, give the sacrificial anode effectiveness and Si6.0 – 13.0wt% and Zn1.5 – 4.0wt% is specifically contained. Alloy [ with which the remainder consists of aluminum and an unescapable impurity ] or Si6.0 – 13.0wt% and Zn1.5 – 4.0wt% is contained. Furthermore, Bi0.01 – 0.3wt%, Be0.0001 – 0.002wt%, In0.01 – 0.10wt%, Sn0.01 – 0.10wt%, 1 of Ga0.01 – 0.10wt% of sorts and two sorts or more are contained, and the alloy with which the remainder consists of aluminum and an unescapable impurity is used.

[0047] The reason for component limitation of such wax material is explained below.

[0048] Si:Si is an alloy element indispensable as aluminium alloy wax material, reduces the melting point of wax material and has the operation which makes the fluidity of a melting wax good. The effectiveness had few Si contents less than [ 6.0wt% ], and since the fall of workability was caused when exceeding 13.0wt(s)% on the other hand, the amount of Si was made into 6.0 – 13.0wt% of within the limits.

[0049] It is added by the aluminium alloy, Zn:Zn makes the potential \*\* at a case, and it is added in order to demonstrate the sacrificial anode effectiveness to a \*\*\*\* core material. The effectiveness will have few Zn additions less than [ 1.5wt% ], if it adds exceeding 4.0wt(s)% on the other hand, self-corrosive action becomes intense, and it reacts with the saw lock flux currently generally used by inert atmosphere soldering, and will shine, and a sex will be degraded. Then, the amount of Zn in wax material was made into 1.5 – 4.0wt% of within the limits. In addition, the amount of Zn of wax material of being regulated also from relative relation with the amount of Zn it not only considers as 1.5 – 4.0wt% of within the limits, but contained in a sacrifice layer as already stated is natural.

[0050] Bi:Bi raises the fluidity of a melting wax and has the effectiveness of improving soldering nature. Less than, the effectiveness is saturated with less than [ 0.01wt% ], and the amount of Bi (s) spoils economical efficiency, even if the effectiveness is not acquired but adds exceeding 0.3wt(s)% on the other hand. Then, when Bi was added, it considered as 0.01 – 0.3wt% of within the limits.

[0051] Be:Be also raises the fluidity of a melting wax and it has the effectiveness of improving soldering nature. Less than, the effectiveness is saturated with less than [ 0.0001wt% ], and the amount of Be(s) spoils economical efficiency, even if the effectiveness is not acquired but adds exceeding 0.002% on the other hand. Therefore, when Be was added, it considered as 0.0001 – 0.002wt% of within the limits.

[0052] If there is an operation which makes potential \*\*, therefore it is added by wax material, they will be made to contribute for the sacrificial anode effectiveness to improve while each of In, Sn, Ga:In, and Sn and Gn(s) improve soldering nature, when added by the aluminium alloy. Respectively, the effectiveness has few additions less than [ 0.01wt% ], and if 0.10wt% is exceeded, since there is a possibility of the potential of wax material becoming \*\* too much, and a corrosion rate speeding up, and reducing corrosion resistance conversely, all have 0.01 – 0.10wt% of within the limits suitable for the addition.

[0053] Although Fe contains as an unescapable impurity in an aluminium alloy besides each above-mentioned element, since Fe reduces the corrosion resistance of wax material, it is desirable that there are as much as possible few the contents. As for the amount of Fe(s), less than [ 0.7wt% ] is desirable, and, specifically, less than [ 0.5wt% ] is more desirably suitable for it.

[0054]

[Embodiment of the Invention] The example of a laminated structure of the brazing sheet of this

invention is shown in drawing 1 - drawing 4 .

[0055] Drawing 1 shows the simplest example of a laminated structure that applied the characteristic laminated structure of this invention only to the one side side of a core material, the clad of the sacrifice layer 4 which contains the above Zn in the one side side of a core material 3 in this case is carried out, and the clad of the wax material 1 which added the above Zn to the front-face side of that sacrifice layer 4 further is carried out.

[0056] Moreover, drawing 2 shows the example of a laminated structure which applied the characteristic laminated structure of this invention to both-sides side of a core material, the clad of the sacrifice layers 4 and 4 containing the respectively above Zn is carried out to both-sides side of a core material in this case, and the clad of the wax material 1 and 1 which added the respectively above Zn is further carried out to the front-face side of each sacrifice layers 4 and 4.

[0057] Furthermore, the characteristic laminated structure of this invention is applied to one one side side of a core material, and the example of a laminated structure which carried out the clad only of wax material or the sacrifice jacket is shown in the one side side of another side of a core material at drawing 3 and drawing 4 .

[0058] That is, in the case of drawing 3 , the clad of the wax material 1 which the clad of the sacrifice layer 4 containing the above Zn was carried out to one one side side of a core material 3, and added the above Zn on the sacrifice layer 4 is carried out, and the clad of another wax material 2 is further carried out to the one side side of another side of a core material 3. As another wax material 2 in this case, aluminium alloy wax material, such as not only the wax material that added the above Zn but the usual aluminum-Si system or an aluminum-Si-Bi system, can be used.

[0059] Moreover, in the case of drawing 4 , the clad of the wax material 1 which the clad of the sacrifice layer which adds the above Zn was carried out to one one side side of a core material, and added the above Zn on the sacrifice layer 4 is carried out, and the clad of the sacrifice jacket 5 is further carried out to the one side side of another side of a core material 3. The sacrifice jacket 5 in this case does not need to be the alloy of the not necessarily same component presentation within the limits as the sacrifice layer 4 which consists of the above Zn content alloys by which it is characterized by this invention that what is necessary is just what potential is \*\* and demonstrates the sacrificial anode effectiveness to a core material to the potential of a core material 3.

[0060] In addition, although what is necessary is not to limit especially the rate of a clad of the wax material which added the above Zn, and just to define it suitably according to an application, total thickness, etc. of a final brazing sheet, if it is generally about 5 - 20%, good soldering nature is securable. Moreover, although what is necessary is not to limit especially the rate of a clad of the sacrifice layer which consists of an alloy containing Zn, either, and just to set suitably with the application of a final brazing sheet, total thickness, the thickness of wax material, etc., if it is generally about 5 - 20%, the expected engine performance can be obtained. If the board thickness of a brazing sheet takes into consideration diffusion of Zn at the time of soldering heating, the effectiveness of this invention will become it is remarkable and remarkable by 0.4mm or more.

[0061] In addition, it is not limited especially that what is necessary is just to apply the approach used for the manufacture approach of the usual clad plate etc. as the manufacture approach of the brazing sheet of this invention.

[0062] [ whether since each alloy ingredient is cast, respectively and it specifically homogenizes if needed, it hot-rolls, and it considers as predetermined board thickness, and ] Or consider as predetermined thickness only by facing, without hot-rolling, pile up each plate after that, and hot rolling performs clad rolling. That what is necessary is to cold-roll after giving intermediate annealing if needed, and just to consider as the last board thickness, by the halfway of cold rolling, intermediate annealing may be performed and the last annealing may be given if needed after the last cold rolling. What is necessary is here, just to use the general semi-continuous casting method as the casting approach. Moreover, although 450-580 degrees C is suitable as soak temperature in this case, in order to raise erosion-proof nature more, it is desirable [ it is

desirable to perform soaking in consideration of the erosion-proof nature by the melting wax about a core material or a sacrifice layer after casting and ] to perform soaking at high temperature. Although hot rolling is usually applied as mentioned above, clad rolling of two clad rollings or more being combined is natural when there are many laminatings. In addition, in order to make junction nature good at the time of clad rolling, it is desirable to perform removal and cleaning of an oxide film by acid washing or alkali cleaning, solvent degreasing, etc. about a clad mating face, and to defecate a front face in advance. What is necessary is just to define cold rolling, the existence of annealing, the conditions of annealing, etc. according to each temper condition, for example — in the case of the core plate for evaporators, in order to perform press forming, it is necessary to make it into O material (full-annealing material) and, and in the tube material of a radiator, H1n work timber is usually use — although what is necessary is just to define the last temper condition by a class of heat-exchanger components, an application of a heat exchanger, etc. which use a brazing sheet.

[0063] Thus, in soldering using the obtained brazing sheet, it curses and especially law is not limited, but especially the brazing sheet of this invention fits flux soldering and inert atmosphere soldering. Moreover, although especially the application of the brazing sheet of this invention is not limited, it is suitable for automobile heat exchanger material, and suitable not only for a passenger car but the oil cooler material of large-sized cars, such as a truck.

[0064]

[Example] Hereafter, the example of this invention is explained. Each alloy of the component presentation shown in alloy sign AA-AO of Table 1 – 3, BA-BR, and CA-CP was ingoted with the usual solution process, was cast, and it considered as the ingot. And about alloy AA-AO for core materials, and alloy BA-BR for sacrifice layers, it homogenized to the ingot according to the conventional method. And about alloy BA-BR for sacrifice layers, and alloy CA-CP for wax material, it hot-rolled and considered as predetermined board thickness. Subsequently, the clad of a sacrifice layer and the wax material was carried out with hot rolling to the core material, and it considered as 4mm of hot rolling going-up clad thickness, and after cold rolling, it annealed if needed, and cold-rolled further, and the laminating configuration as shown in sample No.1–31 of Table 4 and Table 5, and the brazing sheet which has board thickness were created. In addition, almost all the brazing sheets that include the example of this invention in Table 4 and Table 5 were made into the laminated structure as shown in drawing 3 , and were made into the laminated structure which excluded the sacrifice layer 4 from the laminated structure of drawing 3 only about a part of example of a comparison (sample No.13, No.14).

[0065] saw lock flux 5% of marketing after performing cleaning processing with a solvent about each obtained brazing sheet — it was immersed into the water solution and heated by cursing for 3 minutes at the temperature of 600 degrees C in nitrogen gas after desiccation. Then, as a corrosion test, it was immersed into OY water (195ppmCl<sup>-</sup>, 60ppmSO<sub>4</sub> 2<sup>+</sup>, 30ppmFe<sup>3+</sup>, 1ppmCu<sup>2+</sup>;pH3), heating and cooling were repeated in the cycle of 88 degree-Cx8hr→ room temperature x16hr, and the corrosion situation was observed four months after. In addition, observation of a corrosion situation was performed about the part which is not soldering, i.e., a general part, (however, soldering heating is made), and the soldering part. The result is shown in Table 6. In addition, all over Table 6, the difference [(AZn)–(BZn)] of the amount (AZn) of Zn in the wax material before soldering heating (wax material of the sign 1 of drawing 3 ) and the amount (BZn) of Zn in a sacrifice layer (sacrifice layer of the sign 4 of drawing 3 ) is shown collectively. Here, in the case of the example of a comparison (sample No.13, No.14) which does not have the sacrifice layer, the amount of Zn in wax material showed the difference of the above-mentioned amount of Zn. Moreover, after leaving it for one week at the room temperature after soldering heating as reinforcement after soldering heating, the tensile test was performed and tension strength was measured.

[0066]

[Table 1]

合金	合 金 成 分 (WT%)										備 考
符号	M g	S i	Z n	M n	C r	Z r	F e	C u	T i	A l	
A A	0.3	0.8	—	—	—	—	0.3	—	—	残	芯材
A B	0.1	1.0	—	—	—	—	0.3	0.25	—	残	芯材
A C	0.6	0.8	—	—	—	—	0.4	—	—	残	芯材
A D	0.4	1.1	—	—	—	—	0.4	—	—	残	芯材
A E	0.3	0.8	—	—	—	—	0.3	—	0.15	残	芯材
A F	0.4	0.8	—	0.3	—	—	0.4	—	—	残	芯材
A G	0.4	0.8	—	—	0.15	—	0.2	—	—	残	芯材
A H	0.4	0.8	—	—	—	0.15	0.1	—	—	残	芯材
A I	0.4	0.8	—	0.3	—	—	0.4	—	—	残	芯材
A J	0.5	0.4	—	—	—	0.15	0.3	—	0.15	残	芯材
A K	0.4	0.8	—	—	0.15	—	0.2	0.10	0.07	残	芯材
A L	0.3	1.0	—	0.1	—	0.1	0.3	0.10	0.25	残	芯材
A M	—	0.3	—	1.0	—	—	0.2	0.15	—	残	芯材
A N	—	0.5	—	1.0	—	—	0.15	—	—	残	芯材
A O	0.3	0.8	—	0.5	—	—	0.10	0.25	0.15	残	芯材

[0067]

[Table 2]

合金	合 金 成 分 (WT%)										備 考
符号	Mg	Si	Zn	Mn	Cr	Zr	Fe	Cu	Ti	Al	
BA	—	0.2	1.2	—	—	—	0.3	—	—	残	犠牲層
BB	—	0.2	1.5	—	—	—	0.3	—	—	残	犠牲層
BC	—	0.3	2.0	—	—	—	0.2	—	—	残	犠牲層
BD	—	0.1	3.0	—	—	—	0.3	—	0.10	残	犠牲層
BE	—	0.2	3.8	0.2	—	—	0.2	—	—	残	犠牲層
BF	—	0.2	2.0	—	0.15	—	0.2	—	—	残	犠牲層
BG	—	0.2	2.0	—	—	0.15	0.2	—	0.20	残	犠牲層
BH	—	0.1	3.0	—	—	—	0.3	0.30	—	残	犠牲層
BI	—	0.2	2.0	0.5	—	—	0.3	0.40	—	残	犠牲層
BJ	0.4	0.2	2.0	—	—	—	0.2	—	—	残	犠牲層
BK	0.4	0.7	2.5	0.2	—	—	0.1	—	—	残	犠牲層
BL	0.6	0.8	2.5	—	—	—	0.2	—	—	残	犠牲層
BM	0.4	1.1	2.0	—	—	—	0.3	—	—	残	犠牲層
BN	0.1	0.2	2.5	0.3	0.10	—	0.4	0.10	—	残	犠牲層
BO	—	0.4	2.5	0.8	0.15	—	0.6	0.2	0.1	残	犠牲層
BP	0.4	0.6	3.5	1.2	—	0.1	0.3	0.3	0.2	残	犠牲層
BQ	—	0.2	0.8	—	—	—	0.3	—	—	残	犠牲層
BR	—	0.2	4.2	—	—	—	0.2	—	—	残	犠牲層

[0068]

[Table 3]

合金 符号	合 金 成 分 (WT%)									備 考
	S i	Z n	F e	B i	B e	I n	S n	G a	A l	
C A	6.5	1.6	0.5	0.03	—	—	0.04	—	残	ろう材
C B	7.5	2.0	0.4	—	—	—	—	—	残	ろう材
C C	9.0	2.5	0.6	0.30	—	—	—	—	残	ろう材
C D	13.0	4.0	0.6	—	0.002	—	—	—	残	ろう材
C E	7.5	3.5	0.5	—	0.002	—	—	—	残	ろう材
C F	7.5	2.0	0.4	—	—	0.04	—	—	残	ろう材
C G	7.5	2.0	0.5	—	—	—	—	0.06	残	ろう材
C H	8.0	3.5	0.5	—	—	0.11	—	—	残	ろう材
C I	8.0	3.5	0.6	—	—	—	0.11	—	残	ろう材
C J	8.0	3.5	0.5	—	—	—	—	0.12	残	ろう材
C K	5.5	2.5	0.4	—	—	—	—	—	残	ろう材
C L	13.5	3.0	0.5	—	—	—	—	—	残	ろう材
C M	7.5	0.8	0.4	—	—	—	—	—	残	ろう材
C N	7.8	4.2	0.4	—	—	—	—	—	残	ろう材
C O	7.5	—	0.4	—	—	—	—	—	残	ろう材
C P	8.0	3.0	0.5	—	—	—	—	—	残	ろう材

[0069]

[Table 4]



サンプル No		層 の 構 成				板厚 (mm)	備 考
		ろう材1	犠牲層	芯 材	ろう材2		
1	合金符号	CA	BA	AA	CO	1.0	発明例
	クラフト率(%)	8	8	76	8		
2	合金符号	CB	BB	AB	CO	1.0	発明例
	クラフト率(%)	8	8	76	8		
3	合金符号	CB	BB	AC	CO	1.0	比較例
	クラフト率(%)	8	8	76	8		
4	合金符号	CB	BB	AD	CO	1.0	比較例
	クラフト率(%)	8	8	76	8		
5	合金符号	CC	BC	AE	CO	1.0	発明例
	クラフト率(%)	8	8	76	8		
6	合金符号	CE	BD	AF	CO	1.0	発明例
	クラフト率(%)	8	8	76	8		
7	合金符号	CD	BE	AG	CO	1.0	発明例
	クラフト率(%)	8	8	76	8		
8	合金符号	CF	BF	AH	CO	1.0	発明例
	クラフト率(%)	8	8	78	8		
9	合金符号	CA	BA	AI	CO	1.0	比較例
	クラフト率(%)	8	8	78	8		
10	合金符号	CG	BG	AJ	CO	1.0	発明例
	クラフト率(%)	8	8	76	8		
11	合金符号	CH	BH	AK	CO	1.0	発明例
	クラフト率(%)	8	8	78	8		
12	合金符号	CB	BJ	AL	CO	1.0	発明例
	クラフト率(%)	8	8	76	8		
13	合金符号	CB	—	AM	CO	1.0	比較例
	クラフト率(%)	8	8	76	8		
14	合金符号	CB	—	AN	CO	1.0	比較例
	クラフト率(%)	8	8	76	8		
15	合金符号	CA	BA	AM	CO	1.0	比較例
	クラフト率(%)	8	8	76	8		
16	合金符号	CB	BI	AB	CO	1.0	比較例
	クラフト率(%)	8	8	76	8		
17	合金符号	CI	BN	AK	CO	1.0	発明例
	クラフト率(%)	8	8	76	8		
18	合金符号	CA	BQ	AO	CO	1.0	比較例
	クラフト率(%)	8	8	76	8		

[0070]

[Table 5]

サンプル No		層 の 構 成				板厚 (mm)	備 考
		ろう材 1	犠牲層	芯 材	ろう材 2		
19	合金符号	CN	BR	AO	CO	1.0	比較例
	グラット率(%)	8	8	76	8		
20	合金符号	CM	BA	AO	CO	1.0	比較例
	グラット率(%)	8	8	76	8		
21	合金符号	CO	BC	AO	CO	1.0	比較例
	グラット率(%)	8	8	76	8		
22	合金符号	CD	BF	AO	CO	1.0	比較例
	グラット率(%)	8	8	76	8		
23	合金符号	CP	BJ	AO	CO	1.0	発明例
	グラット率(%)	8	8	76	8		
24	合金符号	CJ	BK	AO	CO	0.8	発明例
	グラット率(%)	10	10	70	10		
25	合金符号	CP	BL	AO	CO	0.8	比較例
	グラット率(%)	10	10	70	10		
26	合金符号	CB	BM	AO	CO	0.8	比較例
	グラット率(%)	10	10	70	10		
27	合金符号	CE	BO	AO	CO	0.8	比較例
	グラット率(%)	10	10	70	10		
28	合金符号	CI	BP	AO	CO	0.8	比較例
	グラット率(%)	10	10	70	10		
29	合金符号	CK	BF	AO	CO	0.8	比較例
	グラット率(%)	10	10	70	10		
30	合金符号	CL	BC	AO	CO	0.8	比較例
	グラット率(%)	10	10	70	10		
31	合金符号	CB	BD	AO	CO	0.8	比較例
	グラット率(%)	10	10	70	10		

[0071]

[Table 6]

No	ろう材1と 犠牲層の Zn量の差  (WT%)	OY水腐食試験結果				ろう付け 加熱後の 引張強さ  (N/mm <sup>2</sup> )	備 考
		一般部		ろう付け部			
		腐食形態	最大腐食 ピット 深さ(mm)	腐食形態	最大腐食 ピット 深さ(mm)		
1	0.4	全面腐食	0.14	孔食	0.8	170	発明例
2	0.5	"	0.14	孔食	0.8	150	発明例
3	0.5	ろう付け不良につき腐食試験せず				190	比較例
4	0.5	孔食 芯材溶融	貫通	孔食	1.2	190	比較例
5	0.5	全面腐食	0.16	孔食	0.9	170	発明例
6	0.5	全面腐食	0.13	孔食	1.0	180	発明例
7	0.2	"	0.13	"	1.1	182	発明例
8	0	"	0.15	"	0.9	185	発明例
9	0.4	孔食	0.45	"	0.8	200	比較例
10	0	全面腐食	0.15	"	0.9	170	発明例
11	0.5	"	0.13	"	1.0	190	発明例
12	0	"	0.14	"	0.9	190	発明例
13	2.0	孔食	貫通	"	0.9	110	比較例
14	2.0	孔食	貫通	"	0.8	110	比較例
15	0.4	全面腐食	0.15	"	0.8	105	比較例
16	0	孔食	0.60	"	0.8	150	比較例
17	1.0	全面腐食	0.13	"	1.0	190	発明例
18	0.8	孔食	貫通	"	0.7	185	比較例
19	0	ろう付け不良につき腐食試験せず				183	比較例
20	-0.4	孔食	貫通	孔食	0.8	182	比較例
21	-2.0	"	"	"	0.8	183	比較例
22	2.0	全面腐食 一部孔食	0.40	"	1.0	185	比較例
23	1.0	全面腐食	0.14	"	0.9	195	発明例
24	1.0	"	0.14	"	1.0	188	発明例
25	0.5	ろう付け不良につき腐食試験せず				189	比較例
26	0	孔食 犠牲層が溶融した	貫通	孔食	0.8	182	比較例
27	0	全面腐食	0.14	孔食	0.9	188	発明例
28	0	"	0.13	"	1.1	182	発明例
29	0.5	ろう付け不良につき腐食試験せず				190	比較例
30	1.0	圧延製造時エッジ割れが激しく製造不能				-	比較例
31	-1.0	全面腐食 一部孔食	0.40	孔食	1.1	188	比較例

[0072] When it was the example of a comparison (No.13, No.14) to which the sacrifice layer containing Zn does not intervene between the wax material and core materials which added Zn so that clearly from Table 6, pitting occurred in general parts other than a soldering part, the maximum corrosion depth also became large, penetration has arisen, and it became clear that it was inferior to corrosion resistance. Moreover, pitting occurred in the general part similarly in the example of a comparison (No.18) which had too few amounts of Zn of a sacrifice layer, and the maximum corrosion depth was also penetration greatly. On the other hand, in the example of a comparison (No.19) which had too many amounts of Zn of a sacrifice layer, since soldering nature was inferior and it became poor soldering, the corrosion test of a soldering part was not performed.

[0073] With a No3. alloy, since it reacted with saw lock flux since the amount of Mg in a core material was over 0.5wt(s)%, and soldering nature falls remarkably, and would shine and the defect occurred, a corrosion test was not performed. With No.4 alloy, since the amount of Si in a core material exceeded 1.0wt(s)%, the core material fused during soldering heating and the corrosion-resistant improvement by the sacrifice layer was not obtained. With No.9 alloy, the amount of Cu(s) in a core material is high, pitting occurred, and corrosion resistance was falling compared with the invention alloy. With No.15 alloy, reinforcement is 2 105Ns/mm because of core material 3003 alloy. A low result is brought compared with the invention alloy.

[0074] With No.16 alloy, Cu content of a sacrifice layer was high, and became pitting, and

corrosion resistance fell. With No.25 alloy, since Mg content of a sacrifice layer was high, it reacted with saw lock flux and soldering nature fell remarkably, a corrosion test was not performed. With No.26 alloy, since Si content of a sacrifice layer was high, the sacrifice layer fused at the time of soldering heating, and corrosion resistance fell.

[0075] In the example of a comparison (No.29) which still had too few amounts of Si of wax material, soldering nature was bad and did not result in the corrosion test. On the other hand, in the example of a comparison (No.30) which had too many amounts of Si of wax material, since rolling nature was inferior, the edge crack was intense at the time of rolling, and did not result in completion of a sample at it. Moreover, there are too few amounts of Zn of wax material, in the example of a comparison (No.21) which moreover did not add Zn to the example of a comparison (No.20) which had few amounts of Zn of wax material than the amount of Zn of a sacrifice layer, and wax material, pitting arose in the general part and corrosion has penetrated. Furthermore, although No.22 and No.31 are contained in each component within the limits which the content of each alloy element of wax material and a sacrifice layer itself specifies by this invention No.31 [ among those, ] — the example of a comparison which had more amounts of Zn of a sacrifice layer than the amount of Zn of wax material, and No.22 — the amount of Zn of wax material — \*\* — it was the example of a comparison for which the difference with the amount of Zn of a sacrifice layer exceeded 1.0%, and pitting all occurred in part into the general part in these cases, and the maximum corrosion depth also increased.

[0076] On the other hand, as for the case of each example of invention which has the component presentation of each class within the limits of this invention, and moreover has it within limits with the proper difference of the amount of Zn of wax material, and the amount of Zn of a sacrifice layer, the general part and soldering part all showed good corrosion resistance. Moreover, the reinforcement after soldering heating is 2 about 110Ns/mm, when Mg and Si do not live together in a core material like No.13, No.14, and No.15. A core material is 2 150–200Ns/mm with the alloy of this invention presentation range to low one. The improvement in on the strength is distinct.

[0077]

[Effect of the Invention] Since the sacrifice layer containing Zn of an amount suitable between the wax material and core materials which added Zn is made to intervene according to the brazing sheet of this invention, Diffusion of Zn from the melting wax at the time of soldering heating to the direction of a core material is controlled, and after soldering heating can secure Zn of amount sufficient in a wax material layer, as a result, fully demonstrates the sacrificial anode effectiveness by the wax material layer, and is made [ that the outstanding corrosion resistance is shown or ]. Moreover, since the quantity of the amount of Zn of wax material is not made to increase superfluously, the corrosion resistance which would pile when attaching would use saw lock flux, did not reduce a sex, therefore was excellent, and good soldering nature can be obtained to coincidence. Furthermore, by containing Mg of the suitable amount for a core material, and the amount of Si, improvement in on the strength can be aimed at from the thing using the present aluminum–Mn system alloy as a core material, and it is after soldering heating, and is 2 150–200Ns/mm. In case it has reinforcement, therefore uses for a heat exchanger etc., it becomes possible to attain the thinning of board thickness, and the whole lightweight-ization.

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[Translation done.]

**\* NOTICES \***

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** It is rough explanation-drawing of longitudinal section showing the 1st example of the laminated structure of the brazing sheet of this invention.

**[Drawing 2]** It is rough explanation-drawing of longitudinal section showing the 2nd example of the laminated structure of the brazing sheet of this invention.

**[Drawing 3]** It is rough explanation-drawing of longitudinal section showing the 3rd example of the laminated structure of the brazing sheet of this invention.

**[Drawing 4]** It is rough explanation-drawing of longitudinal section showing the 4th example of the laminated structure of the brazing sheet of this invention.

**[Description of Notations]**

- 1 Wax Material
- 2 Wax Material
- 3 Core Material
- 4 Sacrifice Layer
- 5 Sacrifice Jacket

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**[Translation done.]**

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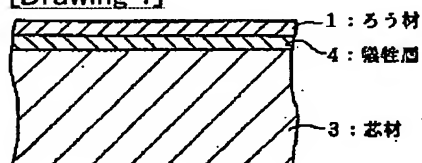
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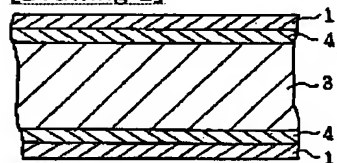
DRAWINGS

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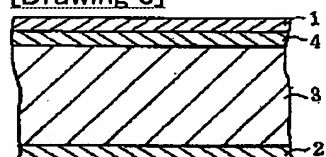
[Drawing 1]



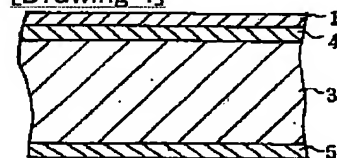
[Drawing 2]



[Drawing 3]



[Drawing 4]



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[Translation done.]